

Chapter 1

From script to print

The origins of writing

The earliest evidence for the existence of *Homo sapiens* derives from the interpretation of archaeological and palaeontological evidence rather than from records consciously made by people themselves. Our species was already in an advanced stage of physiological and intellectual development before we began to leave a deliberate mark on the world around us. The first such marks, perhaps the first consciously created records, are the graphic representations of daily life which have been found in caves in France and elsewhere. Scholars debate the significance of these, whether they are religious, social, or merely artistic; for our purposes, their importance is that we have here the first evidence of a species which sought some means to represent the world in which it lived. It found a material on which the representation could be recorded - the rock walls of a cave - and a medium - natural dyes - in which it could be made.

Between palaeolithic cave paintings and the first real records of human activities there are millennia. The earliest cave paintings are generally considered to date from 40,000 years ago; even so, they embody the basic principle of meeting a perceived need by developing, or making use of, a combination of medium and material. All subsequent systems have developed from that same perception of need.

When complex societies began to evolve in various parts of Asia, their very complexity forced them to consider, possibly even consciously, how complexity could be managed. Pictorial representation, forceful as it is and important as it continues to be, is limited. While pictures can convey

shapes and colours far more effectively than words, and can often give greater clarity than a verbal description of an action or a scene, they are less effective in embodying abstractions or ideas. A picture can show the shape and colour of a house but cannot state its financial value. A picture can represent the appearance of a person, but cannot show what that person is thinking. A picture can reproduce, with great accuracy, the appearance of a car, but it can neither explain how it works nor show it in motion. To preserve an image of anything other than a purely visual and static world, we first need a system which allows us to express language in some representational form.

The essence of all writing systems, the oldest and still the most important means of achieving this, is that they allow language which describes the abstract to take on a concrete form, and in some cases can simulate the language even more accurately by representing its sounds as well as the ideas which the sounds convey. The earliest writing systems, however, were non-alphabetic, and clearly derived from the practice of drawing pictures. The history of the earliest writing is necessarily obscure, but it seems likely that it evolved in the Middle East about 5000 years ago.

Its purpose was utilitarian. A stage of societal development had been reached in which something like a state was evolving. There were rulers and ruled. There was a social and economic order in which some were richer and more powerful than others. Wealth and power depended upon many factors, of which the most important was perhaps access to the raw materials of human survival: food and water. Those who were powerful enough to control natural resources were able to exercise control over others, whether on a small or a large scale. Men fought for the control of such resources. There were organized groups, in which submitting to the leadership of the strongest or the cleverest was clearly advantageous to the less strong or the less clever if, in return, they were able to share in the resources. The gradual emergence of the concept of the state with a common ruler and common interests led to the need for common resources. It was this that seems to have forced the development of writing systems.

The monarchies of the Tigris-Euphrates valley - on the borders of modern Iran and Iraq - raised taxes from their subjects in order to sustain

themselves and their actions for the common good. As this process was regularized, it became necessary to record what had been paid, for what purpose, and by and to whom payment had been made. This necessitated a system which could record quantity as well as indicate the material in which payment had been made. Thus if the ruler demanded a proportion of the crop as a form of taxation (in return for the defence of the farmer's land), the writing system had to be able to represent the crop itself, its total size, the relationship between that total and the farmer's liability, and the fact of payment having been made. No purely graphic system could achieve this, and what evolved was a means of using modified pictorial images.

Corn, the most basic commodity of such a society, was represented by a symbol clearly derived in part from its appearance. Numbers are more complicated, but even for them a form of visual representation was possible. It was based on the fingers of the human hand, so that a single stroke represented 'one', two strokes 'two', and so on. Symbols could be used which described people by their attributes: a ceremonial headdress or crown for the king, a hoe for the peasant, and so on. A representational writing system of this kind was limited but practical.

A writing system, however, can never be independent of the medium in which it can be used. Such a medium, like the writing system itself, emerges out of social necessity and environmental circumstances. In the Tigris-Euphrates valley there is water, sand and intense heat. Taken together, they allowed the peoples of the region to develop simple but effective mechanisms for turning mud into bricks by combining the sand and the water, and drying it in the sun. As it dried, inscriptions could easily be made in the surface of the brick, which, when it was baked, would be permanent. It is on such clay tablets that the earliest written records of mankind are to be found.

The system of writing used in the ancient Middle East is known to scholars as *cuneiform* (literally 'wedge-shaped', derived from the shape of the instrument used for inscribing the symbols in the clay). Significant numbers of clay tablets containing such inscriptions have been found by archaeologists, and can be seen in museums around the world. Cuneiform, however, was not unique. Other systems evolved along similar lines

elsewhere, many of them, like cuneiform, essentially derived from an attempt to use a modified form of pictorial representation of objects. Such modifications, however, still carried with them the essential disadvantages of representational systems based, however distantly, on pictorial images: an inability to convey abstractions and actions. It was possible to represent a king, but less easy to illustrate 'monarchy' or 'state'. Some writing systems achieved this by using the image of an object (a crown to represent 'king') to mean the abstraction which the object itself symbolized or embodied (a crown to represent 'sovereignty'). The script which began to be developed in China in about 1500 BCE became particularly adept at this. Characters for objects could even be combined to represent a concept associated with the combination.

The transition from purely pictorial systems (*pictographs*) to systems which combined pictographs and characters for more abstract concepts (*hieroglyphs*) took place independently in China and in Egypt. Neither pictographs nor hieroglyphs, however, really address the central problem of the representation of language. Language evolved as sounds, and different languages use sounds in different ways. Some sounds, or phonemes, which are common in some languages are unknown in others; the 'th' sound in words like 'the' in English does not exist in French, and is as notoriously difficult to a native speaker of French as the French 'r' and 'u' sounds (as in '*rue*') are to native English speakers. Words used to describe objects, actions or attributes are merely commonly understood combinations of sounds. The word 'house' has no absolute meaning any more than '*maison*' has; it merely happens, through a process of development over many centuries, that these two random combinations of sound have come to signify the same object to speakers of different languages. By going behind what is signified by words to the sounds of which the words are constituted, we reach the raw material of language itself.

The realization of this, whether consciously or unconsciously, led to the next stage in the development of writing systems: the use of symbols to represent sounds. The earliest systems, known as *syllabaries*, took the phoneme, or unit of pronunciation, as their building blocks. The 'th' combination is a phoneme in English, but not in French, where the

juxtaposition of the two letters is pronounced quite differently. Phonemes could only be represented symbolically, since they were derived from sounds, not objects. Syllabaries broke the link between visual representation and the representation of human speech. The Chinese pictographs, for example, having been adopted by the Japanese, were modified by them and eventually replaced by a syllabary in which each symbol represents a phoneme. Thus symbols can be combined and recombined to form the visual representation of words, regardless of the meaning of the words themselves.

The alphabet

Although the syllabary could be argued to be a more advanced writing system than hieroglyphs or pictographs, it was still limited in its applications. Where phonemes vary between languages, each language needs its own character set to represent them. Only by breaking the phonemes into even more basic units can the final flexibility be achieved. It was in the Middle East, yet again, that this final stage of development took place, about 3000 years ago. The Phoenicians, a trading people living on the eastern shores of the Mediterranean, developed a form of representing speech which eliminated all pictorial images and almost all representations of phonemes. The Greek alphabet derived directly from this and in that script the phonemes all but vanished. The few survivors, such as θ (theta, the English 'th' sound as in 'the'), are conspicuous by being unusual. For all practical purposes, the ancient Greeks used an alphabet just as we do. A variation of the Greek alphabet, eliminating the remaining phonemic characters, was developed by the Romans, and survives today as our 'Roman' or 'Latin' alphabet, the alphabet in which nearly all European languages are written.

The Latin alphabet is not, however, unique. Greek still survives. Moreover, it was modified by early Christian missionaries to represent some of the Slavic languages of eastern Europe, and in this form, as Cyrillic, it is in use for Russian, Ukrainian, Bulgarian, Serbian and other languages of the region. Another branch of the original Middle Eastern alphabet developed differently among the speakers of Semitic languages, and became both

Hebrew and Arabic. All these various developments have one essential feature in common: an alphabet's adaptability to different languages which have different phonemes. Thus the Latin alphabet can be used for English, French, German, and so on, with only minor modifications such as the use of accents. Cyrillic is also used for several languages. Arabic script is used for Urdu and for other languages in western Asia; a modified form of the Pali script of India is used for the quite different Thai language, and so on. Even more remarkably, languages can change from one script to another. Turkish used to be written in Arabic script, but since 1924 has been written in the Latin alphabet. In many Asian countries, transliteration of public notices, road signs, and the like are a common sight to aid the western visitor. Many of the languages of Africa and the islands of the Pacific, never reduced to writing by their native speakers, can be written only in the Latin characters introduced by colonial conquerors and missionaries. An alphabet is an almost infinitely flexible tool for the representation of language, and hence for its storage and transmission.

The survival of the Latin alphabet after the dissolution of the western half of the Roman Empire in the fifth century is one of the key events in the cultural history of Europe. It was the alphabet in which the sacred writings of the Christian Church were written in the West, as well as being a link with the fading memories of the former glories of Rome, which was still seen as a model of good government and vibrant culture. The alphabet was used when the new rulers of western Europe, the tribes of the east and the north, began to write their own languages, and thus became the alphabet of the emerging western vernaculars. Those northern languages which had evolved their own syllabary systems, such as the runes used for Norse, rapidly succumbed. The common alphabet has preserved and embodied something of the cultural unity of the West for 1500 years, and allowed western Europeans to learn each other's languages with comparative ease. The absence of a common language has been less problematic than it might have been because of the existence of a common alphabet.

The central role of an alphabet in the storage and communication of information cannot be overstated. In essence, it permits the representation in permanent and commonly understood form of a

multiplicity of languages, and hence of any concept which can be expressed in the languages which it represents. It minimizes the obstacles to understanding, is easy to learn, easy to use and readily adaptable. It is not, however, perfect.

In moving to the greater flexibility of alphabetic systems, there were losses as well as gains. The hunting scenes so vividly portrayed by the cave artists can be described in words only with great difficulty and inevitable loss of impact. Colour, sound and some actions are notoriously difficult to describe. No words can express the concept of 'red' to a sightless or colour-blind person, or the concept of 'loud' to a person with no hearing, any more than we can see 'good' or hear 'light'. Moreover, human sensory abilities vary from person to person. To those with perfect pitch, the mere words 'middle C' convey a precise sound which they can 'hear' and perhaps reproduce vocally; to others it may conjure up a visual image of a particular note on the keyboard of a piano, or of a piece of musical notation; to some, it will mean nothing at all. Both knowledge and ability limit our capacity to understand the concepts represented by alphabetic symbols made into words; there are, therefore, limits to the usefulness of the alphabetic symbols themselves.

Images, sounds and numbers

The visual representation of objects, colours and shapes has always been an integral part of human culture. As we have seen, it was the first aspect of human experience to be recorded in a permanent form, and except when representational art has been banned for cultural reasons (as in some Islamic traditions, for example) it has never ceased to exist. Visual imagery has, however, gradually extended beyond simply representing what can be seen. Map-making was perhaps the first example of this. The ancient geographers drew patterns which illustrated their understanding of the shape of geographical features, but they did so in a way which they could not possibly have seen. Until well into the 20th century, almost no human being had ever risen far enough above the surface of the earth to be able to see the shapes of coastlines, for example, or the courses of rivers. Maps have always been made by using conventions of signs and symbols to

represent what is believed to exist but cannot be seen as a whole. The conventions, and the techniques behind them, have changed, but the essential principle has remained the same.

The alphabet embodies a key principle of the communication of information: the need for a means to represent language in a permanent and generally understood form. A map takes this one stage further: the communication of information by the visual representation of that which has to be deduced because it can neither be easily described in language, nor verified by visual observation. Alphabetic and visual information recording systems cannot, however, embody the whole range of human communications. Language embodies thought and speech; pictorial images, whether realistically or symbolically representational, embody what we can see; but we also hear things other than speech. Some non-speech sounds can indeed be alphabetically represented; we can describe a dog as 'barking', a word which signifies, although it does not represent, the sound which the animal makes. We can even try to represent the sound made by the dog as 'woof' or some similar attempt at an onomatopoeic word. No words, however, can convey the sounds of the wind, birdsong or music, and for the latter in particular, a whole series of systems of notation have been developed to allow composers to represent their wishes in a way that is comprehensible to performers. Musical notation, like the symbols on a map, is a recording system which acts as a surrogate for, and works similarly to, an alphabet, in a situation in which the alphabet is inadequate because language itself is inadequate.

Most difficult of all is the representation of quantitative data. Measurement was a concept which was highly developed in the very societies in which the earliest writing systems were developed, but none entirely solved the problem of the representation of numbers and of calculations in which numbers were used. The Greeks developed a vastly complicated system using alphabetic characters, as did the Romans, but even the latter's was almost impossibly clumsy for all but the most elementary mathematical applications. It was the Arabs who finally solved the problem in the ninth century CE, developing nine symbols to represent the numerals from one to nine and (crucially) adopting the Indian concept of zero, and the now universal symbols to represent the

basic functions of addition, subtraction, multiplication and division. Mathematical symbols, like musical notation, are a substitute for the alphabet used to convey concepts for which language is inadequate or inappropriate.

The first media

All these various systems of representing information, whether linguistic, numeric, visual or aural, depend on the existence not only of a means of representation – a system of recording – but also of a means of preserving the representation, that is a form of recording medium. The earliest media were natural substances, such as rock, bone or wood. The rock of the cave was unmodified from its natural form unless the surface was washed or prepared in some other way before the painter set to work. Other media were, however, changed, sometimes quite significantly. Bone, for example, which is the medium on which the oldest Chinese characters are preserved, had to be cleaned and perhaps polished or planed before it could be used. Similarly, wood had to be prepared by cutting, planing and perhaps sizing. Even the ‘natural’ media, therefore, were actually the products of human ingenuity and skill, just like the recording systems which they were designed to carry.

The baked clay tablets of the Assyrians were to prove to be more typical than wood or bone for the future development of media. Different societies evolved different media according to their needs, their technological capacity and the availability of materials. Indeed, in many cultures different media were used for different purposes. The ancient Romans, for example, continued to use stone for monumental inscriptions (as we do ourselves) long after papyrus, vellum and parchment had become common; the choice between the last three was determined partly by purpose and partly by economic considerations. Similarly, the Egyptians painted and inscribed hieroglyphs even after they developed a syllabary that could more conveniently be written on papyrus or parchment.

The important thing about recording media is that they should be appropriate. Appropriateness is not an absolute concept, but it can be broadly defined in terms of fitness for purpose. An inscription on stone,

which can be made only by a highly skilled person over a comparatively long period of time and which can be neither modified nor easily transported, is clearly quite unsuitable for some casual purpose such as making a note of domestic accounts or an *aide-mémoire* of a course of action which has been agreed. Cultures therefore evolve different media for different purposes. For most of the recording systems which we have already discussed, what was needed was a smooth surface on which symbols could be inscribed, written or painted. In turn this required some kind of implement, and (for writing and painting) a substance which could be applied to the surface. The familiar version of this is of pen, ink and paper, all of which have existed, in some form or other, for at least 4000 years.

The most useful media for writing are, literally, the most flexible. Clay tablets, polished stone, bones, wood bark and similar surfaces are solid, but clumsy. They take up a great deal of storage space, and some of them (clay and wood, for example) deteriorate rapidly or (like bone or baked clay) are easily damaged. A strong flexible surface, on the other hand, can be easily stored (by rolling or folding) and is less susceptible to damage, although far from permanent in some cases. In western Asia, in the first millennium BCE, various kinds of vegetable matter and animal derivatives were used to make such materials. The papyrus reed, which grows in the shallows along the banks of the Nile in Egypt and Sudan, could easily be processed into a reasonably good writing material. Although it was a little fragile if it was bent, it could be sewn into large sheets, and rolled for storage if it was treated carefully. The surface, when sized, would hold ink without blotting, and the raw material itself was readily available. Papyrus became one of the most common writing materials in the eastern Mediterranean towards the end of the first millennium BCE.

The alternative to vegetable matter was to use suitably processed animal skins. When stripped from the flesh of a dead beast, cleaned of its hair, and partially tanned, the hide of the cow, goat or camel could be turned into a very effective writing surface. Like papyrus, it could hold the ink, while it had the additional merit of being stronger in some respects. Vellum and parchment are less susceptible to damp than is papyrus, and can also be folded as well as rolled. This was to be of particular importance as the modern form of the book began to evolve in the first and second centuries CE.

The development of the book

The development of the familiar form of the book is a defining moment in the history of information storage and retrieval in the West, almost as significant in its way as the invention of the alphabet. Until about the beginning of the Common Era, written documents were either single sheets, stored (if at all) flat, or long scrolls of sheets of papyrus, vellum or parchment, sewn or glued together end to end. These were stored in cylindrical cases, made of wood or metal, of which examples have been found among the petrified ruins of Pompeii and Herculaneum, and which are still used for ceremonial purposes in storing the scriptures in Jewish liturgical rites.

Towards the end of the first century BCE, small sheets of parchment held together by a single thread at the corner began to be used as informal notebooks, and it was from these that the modern form of the book (the *codex*) was gradually developed over a period of about a century. A key stage in this development was when the sewing together of single sheets was replaced by the folding of the sheets before sewing, creating a codex which was at once simpler and stronger. It seems that the development of the codex was particularly associated with the Christians, perhaps because they needed portable books which could easily be concealed for their missionary activities in the Roman Empire. When Christianity became the established religion of the Empire in the early fourth century CE, the scroll came to be associated with the pagan past. The codex proved so convenient that it even triumphed as a medium for the pagan classics.

The general adoption of the codex is a perfect example of the acceptance of an information storage medium which is fit for purpose. Easy to make, easy to store and easy to use, the codex had every possible advantage over the scroll. Its cultural, religious and ultimately political overtones simply served to make it even more acceptable. Like the alphabet, once Europe had adopted the codex it never abandoned it, and it was to become one of the symbols of European influence in the non-European world from the 15th century onwards.

The codex has proved to have a longer active life than the materials from which the first codices were made. Vellum and parchment were both ultimately replaced by paper, while papyrus could never be used for codices

at all because of its fragility when folded. Paper, unlike papyrus, is a product which undergoes a long and complicated manufacturing process during which the vegetable fibres from which it is made are physically and chemically modified. They are reduced to a pulp with water, and then reconstituted by drying in flat sheets. When the surface is sized, the material can take ink, and the sheet can be unfolded or rolled, and, provided that the materials are reasonably free of chemical impurities and the conditions of storage are reasonably good, it can be stored for long periods of time.

Paper was invented in China at the beginning of the fifth century CE, and the use of it, and the knowledge of the craft of paper-making, spread gradually westwards during the next thousand years. At first it came along the ancient trade routes that linked east and west across the steppes and mountains of what are now the states of central Asia. It reached western Asia at the time of the great Arab cultural expansion in the first century of Islam, and was taken by the Arabs throughout their burgeoning Empire in North Africa and southern Europe. From Spain and Italy it made its way northwards, until, by the 15th century, paper-making and the use of paper were well established throughout southern and western Europe. On the whole, however, it was used for less formal purposes; for formal or important documents, vellum and parchment were still common.

The alphabet, the codex and paper proved to be a formidable combination as an information storage and retrieval system. This was even more true when they were combined with a new system of 'writing' the alphabet on the paper. Writing was a manual process, whether the implement was a stylus, a chisel, a brush or a pen. In China, in the 11th century CE, a form of printing had been invented which involved making reproductions from engraved wooden blocks, a format particularly suited to the vast number of pictographs and syllabaries which, by that time, formed the Chinese character set. The process was adopted in Korea (which used a similar character set), but spread no further, and seems to have remained unknown in the West.

Printing: the first communications revolution

Printing in Europe was invented independently, in the 15th century. The earliest experiments may indeed have been with wooden blocks, but the breakthrough was the realization that the languages written in the Latin alphabet could be printed using only a very small number of characters. The inventor of typographic printing was Johann Gutenberg, a German goldsmith who, with various financial backers, printed the first European book, an edition of the Bible in Latin (1454-5). Gutenberg invented devices for making type as multiple copies of individual raised letters on the upper surface of small pieces of lead, and also various techniques for combining these, applying ink to them and imprinting their image on a suitable surface. The most suitable surface soon proved to be paper. The invention of printing sounded the death knell of parchment and vellum as the normal material for books and documents in Europe.

The rapid spread of the art of printing marked the beginning of a period of profound, even revolutionary, cultural change in the West. Printed books could be produced in great quantities, and were therefore both more widely available and cheaper than their hand-made predecessors. Moreover, every copy of the same edition was identical with every other copy, which allowed a whole series of aids to the use of books to be developed: the index, the citation, the bibliographical record. Because paper was so easy to use for books, and so comparatively strong and adaptable, formats became smaller, books became lighter and more portable and hence even cheaper and even more convenient. The codex itself survived as the normal form of the western book.

The written word, in printed form, became an integral part of life for the first time, a fact whose importance cannot be overemphasized. Print was an apparently far more stable medium than manuscript, and certainly more uniform. It was used by rulers and rebels alike in every sphere of life. No subject of the king could claim to be ignorant of the law when laws were accurately and identically disseminated in printed form. A religious or political dissident could reach a far larger audience when ideas could be circulated in print than had ever been possible when the range was limited either by personal contact and speech or by the production of handwritten

copies. Scholars could read the work of other scholars whom they would never meet, and could study the very sources which had been used when an identical printed version lay upon the desks in front of them. Print transformed many aspects of the cultural, religious and political life of Europe.

The tradition of learning which western Europe had inherited from the ancient world was essentially repetitive rather than critical. Partly under the influence of the Church, which was paramount in all intellectual life for more than a thousand years, enquiry and experimentation were discouraged. Each generation learned what a previous generation had learned before, and little was added to the store of human knowledge and understanding. Originality was discouraged, and if it was achieved its dissemination could easily be prevented. Printing changed that forever. It became possible to compare, to contrast and to analyse on a far greater scale. Variant texts of sacred and secular works alike could be edited and reconciled into a standard, accepted version, which anyone could read and criticize. Scholars who, before the invention of printing, might never have seen more than a few score books in their lives, could now consult libraries containing thousands of books, printed throughout Europe, and written by those who, like themselves, had ever easier access to the growing store of knowledge. Printing provoked the first information explosion.

To contain, exploit and control the potential of print, new mechanisms and new institutions had to be devised. Containment was barely possible. Both secular and ecclesiastical authorities throughout Europe tried to clamp down on printing, but it spread inexorably across the continent. If it could not be suppressed, it could, however, be controlled; censorship by Church and State was an integral part of the world of the printed word almost from its very beginning. Exploitation could take many forms. Those who were censors could use the new medium to propagate their own views, and they did so shamelessly, both in Church and State. Indeed, the very idea of the centralized, bureaucratized nation-state developed in parallel with the spread of printing. But there was another form of exploitation, perhaps more positive, which gave more people access to books and information. After the great religious divide between Protestant and Catholic in the middle of the 16th century, one group - the Protestants - emphasized the

need for literacy. In turn, this led to the creation of new and more inclusive systems of education, and the foundation of libraries, great and small, through which a new educated elite could be created. The process proved unstoppable once it had started, and as print became more integrated into the life of the West, literacy ceased to be a luxury and became a necessity. The invention of printing was a factor in all of this and more, demonstrating, perhaps for the first time, the power which accrues to those who control and have access to information and the concomitant disadvantage of those who do not. Knowledge became cumulative, as each generation added to the store, and recorded its findings and its opinions in a permanent and easily retrievable form, which at last began to realize the full potential of the alphabet as a means of storing linguistic information.

Printing technology was designed for reproducing alphabetic systems, and is less suitable for other forms of representation. The pictographic and syllabary scripts of Asia have always presented a problem to printers, a fact which had important consequences as Europe began to impose its cultural domination on much of the rest of the world. Musical notation and even mathematical symbols similarly presented difficulties (although by no means insuperable ones) to printers, and the reproduction of graphic matter remained a problem for 300 years after the death of Gutenberg. In other words, despite its obvious advantages, printing was a limited medium, but because of its ubiquity, it turned western Europe into a culture dominated by what it could do so easily: reproduce written language. Oral culture, although never entirely lost, was submerged, and both the visual and the aural became parallel and separate experiences from the linguistic. Hence literacy, which had to be acquired by learning, became the basic skill of the western elite, while the more natural skills of seeing and hearing were, to some extent, devalued as mechanisms for information transfer.

For 400 years, printing was the dominant information transfer medium, and for much of that time it was unchallenged. Perhaps for that very reason, further development of the technology was slow. Mechanical power (first steam and then electricity) was applied to the printing press itself in the 19th century, and machine processes replaced handcrafts in paper-making at the same time, but it was not until the 20th century that mechanical systems entirely displaced typesetting by hand, and there are,

to this day, some hand processes in the binding of books. The intense conservatism of the book-making industry - paper-making, printing and binding - reflects the unassailable position which the industry has occupied in the storage and dissemination of information for almost the whole of its history.

The trade in books

The dominance of print also had economic consequences. The gradual evolution of both religious and secular writing in the cultures bordering on the Mediterranean, and further east in both India and China, had, over many centuries, increased the knowledge of reading and writing, and gradually brought it closer to the commercial arena. In Greece, books were undoubtedly bought and sold; in Rome, by the first century BCE, there was a flourishing trade in them. They were copied by professional scribes, sold by booksellers, and even commissioned by 'publishers'. The book trade, such as it was, vanished with the Roman Empire in the West, but it survived in Byzantium, and independently re-emerged in Paris in the 12th century. In due course, in many western cities, professional scribes copied manuscripts for students and scholars, and soon for a few secular customers as well, so that by the middle of the 15th century there was an established book trade in almost all the larger towns of western Europe.

It may well be that it was the demand for books generated by this trade that motivated Gutenberg and others to experiment with a mechanical means which would replace the slow and tedious process of writing by hand every book which was required by a customer. Whether or not this was the case (and it seems likely that it was), the fact remains that the printed book was born into a world in which books were already indissolubly linked with commerce. The process of printing itself ensured that the link could never be broken. Even at the simplest level, a printer needed type, ink, a press and paper, as well as the necessary skills to make use of them. From the beginning, the printing trade needed capital investment, which could only be recouped over the medium term by the sale of the product. This taught harsh lessons to some printers: Gutenberg

was not only the first typographic printer, he was also the first printer to go bankrupt.

Books produced in such unprecedentedly large numbers could not find a large enough market where they were produced, as the products of commercial scriptoria normally had. A bookselling network developed throughout western and southern Europe, based on existing trading routes and trade fairs. By the middle of the 16th century, there was a system of book distribution which allowed books to travel from one end of the continent to the other with little commercial impediment. This served to emphasize the book as an object of commerce, and the information that it contained, therefore, as having some monetary value. The book trade, as it spread across and beyond Europe, and vastly increased in size, became a massive contributor to the economic as well as the cultural life of the 19th and 20th centuries.

The enmeshment of the printed word in the development of capitalist economies inevitably put another obstacle between many people and information which they wanted or needed. By the 19th century, and in some cases earlier, social and political reformers recognized that they could only reach the masses through the printed word if the forms of print were cheap enough for them to buy and common enough to justify the time and effort of learning to read and sustaining their literacy. Education, book provision and political change became closely associated in the minds of many radicals from the 17th century onwards, but never more so than during the 19th century when the partial mechanization of the printing industry brought the price of books and newspapers down to realistic levels for less wealthy buyers and readers. At the same time, governments used fiscal devices as a form of censorship, taxing newspapers and other reading matter in an attempt to prevent the wide circulation of radical ideas. Although this policy was gradually abandoned from the middle of the century onwards in many countries in western Europe, both taxation and formal censorship survived in many other parts of the world.

The 19th century saw the high point of the dominance of western culture by print. A combination of economic, technical, social and political circumstances made the printed word seem to be the unique instrument of

cultural enrichment and even cultural change. No other medium could challenge its capacity to record and reproduce information, while the printed book was a uniquely efficient instrument of information retrieval. Great libraries of such books were the storehouses of the world's knowledge, whether in private hands or accessible to a wider public. Yet as print achieved these pinnacles, the process of displacement began.

Even at the height of its domination, print never displaced the spoken word as the most common means of human communication and information transfer. Orality has always been a parallel skill to literacy, and for most people, throughout most of history, far more important. Much of the knowledge that we need in our daily lives has been acquired orally and by example, from the simplest skills which we were taught as children to the immense complexity of the use of language itself. Even as a formal mechanism for the transmission of information, orality was never entirely displaced. The lecture survived (perhaps for too long) the invention of the textbook. The spoken word was integral to the development of democratic processes, looking back to the partially pre-literate societies of Greece and Rome. In a society in which illiteracy was common (as it was in much of the West until the last quarter of the 19th century) orality remained an essential tool of social intercourse and social control, but if language was to be preserved it had to be written down and perhaps printed.